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PFAS in Food Packaging: A Hot, Greasy Exposure

Nate Seltenrich

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First, there was DDT. Then came BPA. The latest chemical acronym to become a household name is PFAS, short for per- and polyfluoroalkyl substances. The chemicals in this class are valued as strong surfactants and for their ability to repel water, grease, and stains.[1] Among other uses, PFAS are added to paper products designed to hold hot, greasy foods. A recent study in *Environmental Health Perspectives* delves into how such foods might contribute to people's exposures to PFAS.[2]

All PFAS persist in the environment, and some of those found in food packaging are also bioaccumulative and harmful to humans.[1] The class's best-known chemicals, perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), were phased out gradually in the United States between 2000 and 2015.[3] Many new PFAS with shorter fluorinated carbon chains have taken their place.[4] There is evidence that these short-chain PFAS are more rapidly eliminated from the human body,[5,6] yet they still present a concern for human health.[4]

The Silent Spring Institute, a Massachusetts-based nonprofit research organization, is among those investigating PFAS.[7,8,9,10] A 2017 study led by Silent Spring research scientist Laurel Schaider found grease-proof PFAS coatings on 46% of food-contact papers (such as hamburger wrappers) and 20% of paperboard samples (such as french fry boxes) collected from fast food restaurants throughout the United States.[11] In the new *EHP* report, Schaider and colleagues from Silent Spring estimated associations between blood serum levels of five common PFAS (PFOA, PFOS, perfluorononanoic acid, perfluorodecanoic acid, and perfluorohexanesulfonic acid) and consumption of fast food, pizza, and microwave popcorn.[2]

"We had learned that PFAS were widespread in [fast food] packaging,[11] but we wondered whether people who ate more fast food might have elevated exposures to PFAS," Schaider says. "Other work has shown that microwave popcorn bags nearly always have PFAS as well,[12] so we also wondered whether people who ate more popcorn might similarly have higher levels."

The work drew upon data collected from more than 10,000 individuals between 2003 and 2014 as part of the National Health and Nutrition Examination Survey (NHANES). Along with blood samples, the survey collected detailed dietary information, including what people ate—and where they ate it—over the preceding day, week, month, and year.

In an attempt to isolate the role of packaging, which NHANES does not address, Schaider and her colleagues focused on where

The grease-repellent properties of PFAS make them the perfect foil for oily foods. A 2017 study[12] identified 46 different fluorochemicals in popcorn bags from 17 countries around the world. Image: © iStockphoto/groveb.

food was eaten. Because 90% of the food that people reported eating at home came from a grocery store, the researchers assumed much of that food was prepared at home and thus less likely to contact PFAS in packaging. The analyses controlled for consumption of fish and shellfish, which had previously been associated with higher PFAS levels.[13]

Their findings seemed to support their hypothesis: People who ate more food at home averaged lower blood serum concentrations of PFAS, and those who ate out more, including at fast-food and pizza restaurants, averaged slightly higher concentrations. The researchers noted, however, that some of these differences could be related to different types of food consumed at various locations. Popcorn consumption also was associated with significantly higher serum concentrations of four of the chemicals.

Ian Cousins, a professor at Sweden's Stockholm University who was not involved in the study, says he was surprised by the authors' finding of an association between diet and PFOS levels given that the chemical's primary producer in the United States, 3M, stopped making it at the end of 2002[14]—the year before the study's earliest survey.

"The authors do provide a good discussion of why they may find these positive correlations in spite of production changes," he says—namely that recent food consumption may reflect past behavior, and the 4.8-year half-life of PFOS in human blood means it is eliminated slowly. In other words, PFOS present in human blood today reflects past exposure. Still, Cousins says, he'd like to see these ideas tested further.

California-based data scientist Cindy Hu, who also was uninvolved in the current research but previously studied PFAS at Harvard University,[15] says that while the investigation represents an interesting and relevant exercise, there are some important limitations. "If you look at the chemicals that usually appear in food-contact materials, a lot of them are . . . either not included in NHANES or are included but were then dropped by the authors because the detection frequency was too low," Hu says.

Ultimately, the authors concluded that although they cannot definitively attribute the associations they observed solely to food packaging, their findings provide further encouragement to end the use of PFAS in food packaging, as Denmark did in 2019.[16] "The potential for food-contact materials to contribute to PFAS exposure," they wrote, "coupled with concerns about toxicity and persistence, support the use of alternatives."

Nate Seltenrich covers science and the environment from the San Francisco Bay Area. His work on subjects including energy, ecology, and environmental health has appeared in a wide variety of regional, national, and international publications.

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